
Name of Organization: Wisconsin Department of Natural Resources

Type of Organization: State

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Project Title: Wetland Treatment System - Newton Creek, Superior, WI

Project Category: Contaminated Sediments

Rank by Organization (if applicable): 4

Total Funding Requested (\$): 225,500 **Project Duration:** 2 Years

Abstract:

The Wisconsin Department of Natural Resources proposes to conduct a bench-scale study and subsequent pilot-scale demonstration of a wetland treatment system for treatment of residual dissolved contaminants during normal flow conditions at Newton Creek and to remove suspended sediment contaminants during infrequent high flow periods. Sediment contaminants of concern in the Newton Creek System include diesel range organics, PAHs, lead, and mercury. During normal flow conditions, Newton Creek serves as the conduit of treated wastewater effluent from a petroleum refinery to the Hog Island Inlet in Lake Superior. Estimated costs for removal and disposal of contaminated sediments and soils at a landfill are 10 million dollars. A wetland treatment system may serve as a low cost remedial option to mitigate ongoing and/or future sources of contamination. The system may also provide insight into potential in-situ phytoremediation options for the subsurface floodplain soils contamination.

A bench-scale study will be conducted to define the hydraulic design parameters required to design and construct a pilot-scale demonstration study of an integrated subsurface/surface water constructed wetland treatment system. The study will include a literature search to identify wetland plants that could provide the optimal treatment of contaminants in the site specific environment followed by a bench-scale evaluation. Following completion of the bench-scale study, the WDNR will coordinate construction of a pilot-scale demonstration in Newton Creek. The pilot-scale demonstration during the first season will evaluate constructability issues, wetland plant establishment, and suspended sediment settling performance during high volume runoff periods. The results of this study will prove useful for consideration of full-scale remedial options for the Newton Creek system, and at other potentially similar waterways which discharge to the Great Lakes.

Geographic Areas Affected by the Project

States:

<input type="checkbox"/> Illinois	<input type="checkbox"/> New York
<input type="checkbox"/> Indiana	<input type="checkbox"/> Pennsylvania
<input type="checkbox"/> Michigan	<input checked="" type="checkbox"/> Wisconsin
<input type="checkbox"/> Minnesota	<input type="checkbox"/> Ohio

Lakes:

<input checked="" type="checkbox"/> Superior	<input type="checkbox"/> Erie
<input type="checkbox"/> Huron	<input type="checkbox"/> Ontario
<input type="checkbox"/> Michigan	<input type="checkbox"/> All Lakes

Geographic Initiatives:

<input type="checkbox"/> Greater Chicago	<input type="checkbox"/> NE Ohio	<input type="checkbox"/> NW Indiana	<input type="checkbox"/> SE Michigan	<input type="checkbox"/> Lake St. Clair
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Primary Affected Area of Concern: St. Louis River, MN

Other Affected Areas of Concern:

For Habitat Projects Only:

Primary Affected Biodiversity Investment Area:

Other Affected Biodiversity Investment Areas:

Problem Statement:

Newton Creek is located in the City of Superior and originates from a petroleum refinery treated wastewater impoundment at its headwaters, towards the northeast approximately 1.5 miles where it discharges to the Hog Island Inlet. Newton Creek has been identified as a component of the St. Louis River System Area of Concern and is considered to be a potential source of contaminants to Superior Bay and Lake Superior.

Sediments in the Newton Creek system are contaminated with oil and grease, diesel range organics, PAHs, and a variety of metals (including lead and mercury). Widespread shallow subsurface soil contamination appears to exist in the floodplain adjacent to the creek. Ecological impacts appear to be severe in some portions of the creek.

In 1997, approximately 1600 cubic feet of visibly contaminated sediment was excavated by the refinery from the impoundment and 500 feet of the creek channel sediments (although not floodplain soils). At least 18,000 cubic yards of visibly contaminated sediment and floodplain soils remain downstream in Newton Creek and Hog Island Inlet.

Because of the high water and clay content of the contaminated sediments disposal at a landfill was considered unfeasible as a remedial option. Disposal on site would be difficult because of the residential nature of much of the Creek, and future liability issues. In addition, the refinery wastewater treatment system may from time to time fail. The treatment system has failed its permitting requirements for chronic effluent toxicity. Therefore, it is necessary to find a remedial option that could act as a "polish" to the current treatment of discharge water at the refinery.

Proposed Work Outcome:

A wetland treatment system may serve as a low cost remedial option to mitigate ongoing and/or future sources of contamination. The system may also provide insight into potential in-situ phytoremediation options for the subsurface floodplain soils contamination and/or future excavated sediments.

The WDNR proposes to conduct a bench-scale test followed by a pilot-scale demonstration to evaluate the feasibility of using wetland treatment as a remedial option on the Newton Creek system. The conceptual wetland treatment cell would utilize both a surface water flow component and a subsurface flow component to allow treatment of both normal flow conditions and infrequent high flow conditions. A sediment settling basin would be located upstream of the wetland treatment cell to prevent clogging of the wetland cell and facilitate sediment removal.

A bench-scale test would be conducted in a wet laboratory and utilize representative creek bed sediments in a simulated creek channel environment to evaluate resuspension and settling characteristics during normal and flood conditions. The bench-scale test would evaluate various parameters including water velocity, water depth, and flood duration. The test would also evaluate the desorption of contaminants from the sediments to the water column. Selected wetland plants would be obtained and planted in a recirculating system to observe potential contaminant treatment effects.

Following the completion of the bench-scale test, the WDNR would acquire permission from a property owner to install a pilot scale demonstration in a segment of Newton Creek. A model wetland would be constructed and system performance observed. A plot of contaminated sediments would be included in the wetland to evaluate potential phytoremediation effects. Observations regarding constructability, sediment settling efficiency, contaminant reduction, and wetland plant establishment would be summarized and reported.

Project Milestones:

Dates:

Project Start	10/2000
Bench-Scale Study Workplan	11/2000
Bench-Scale Study Results	04/2001
Pilot-Study Workplan	05/2001
Pilot-Study Wetland Construction	06/2001
Spring Runoff Sediment Settling	06/2002
Wetland Plant Establishment	08/2002
Pilot Study - Initial Results Report	10/2002

☐ Project Addresses Environmental Justice

If So, Description of How:

☒ Project Addresses Education/Outreach

If So, Description of How:

The results of this project will be summarized in electronic report format (PDF), and will be made available to the public via the WDNR web page. In addition, a technical conference presentation will be used to disseminate the results of this project to interested professionals. Progress under this project will be shared with the St. Louis River RAP Citizens Action Committee and the Lake Superior Binational Program.

Project Budget:

	Federal Share Requested (\$)	Applicant's Share (\$)
Personnel:	0	9,000
Fringe:	0	1,350
Travel:	0	500
Equipment:	0	0
Supplies:	0	500
Contracts:	225,500	0
Construction:	0	0
Other:	0	0
Total Direct Costs:	225,500	11,350
Indirect Costs:	0	0
Total:	225,500	11,350
Projected Income:	0	0

Funding by Other Organizations (Names, Amounts, Description of Commitments):

The State of Wisconsin is currently funding continued assessment of sediment contamination and loading of the Newton Creek system and Hog Island Inlet. The WDNR is expected to expend 650,000 dollars for investigation and evaluation of remedial options of the Newton Creek and Hog Island Inlet System in the next two years. The WDNR will provide additional staff time as needed, beyond the salary amount designated in the above budget for this scope.

Description of Collaboration/Community Based Support:

Community-based support will be available from the City of Superior, Douglas County, Murphy Oil, Lakehead Petroleum, Dome Petroleum, and other property owners with regards to site availability and access. This project helps to implement recommendations, of the St. Louis River RAP and action in the Lake Superior LAMP. Collaboration with the St Louis River RAP Sediment Committee and the Citizens Action Committee will be on-going.